

# Traumatic Aneurysm of the Superior Cerebellar Artery

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## Summary

*Following a head trauma in a 40-year-old male, massive subarachnoid hemorrhage and fractures of the skull base/clivus was found at CT. CT angiography demonstrated an aneurysm on the proximal part of the right superior cerebellar artery. The aneurysm was successfully coiled without any complication and the patient improved clinically during the following three months. The decline in use of angiography in head trauma patients during the last two decades may lead to a lower detection of traumatic aneurysm than in previous times. The value of angiographic procedures in patients suffering head traumas with SAH and skull base fractures is therefore emphasized.*

## Introduction

Traumatic aneurysms of the posterior circulation are extremely rare<sup>1,2,3</sup> and comprise less than 10% of traumatic aneurysms following head trauma<sup>4,5</sup>. Only two cases with an aneurysm on the superior cerebellar artery (SCA) following head trauma have been reported in the literature<sup>5,6</sup>. Most traumatic aneurysms are located within the anterior circulation, essentially on the middle cerebral artery and anterior cerebral artery<sup>7,8</sup>. The correct diagnosis is most frequently established during surgery<sup>6,9</sup>. Up to now we have not found any case reported with neuroradiological embolization of a

traumatic SCA aneurysm. The most common treatment seems rather to have been surgery<sup>1</sup>. The mortality rate for traumatic aneurysms diagnosed after rupture is 40%, as opposed to 16% of those diagnosed and treated before the onset of SAH.

We report a case with head trauma, fracture of the skull base and subarachnoid hemorrhage (SAH) from an SCA aneurysm. Treatment in an early stage with coiling is efficient and seems important to avoid fatal outcome. The utmost attention should be given to patients with SAH combined with fractures of the upper clivus. CT angiography will probably, as in our case, establish the diagnosis in most cases.

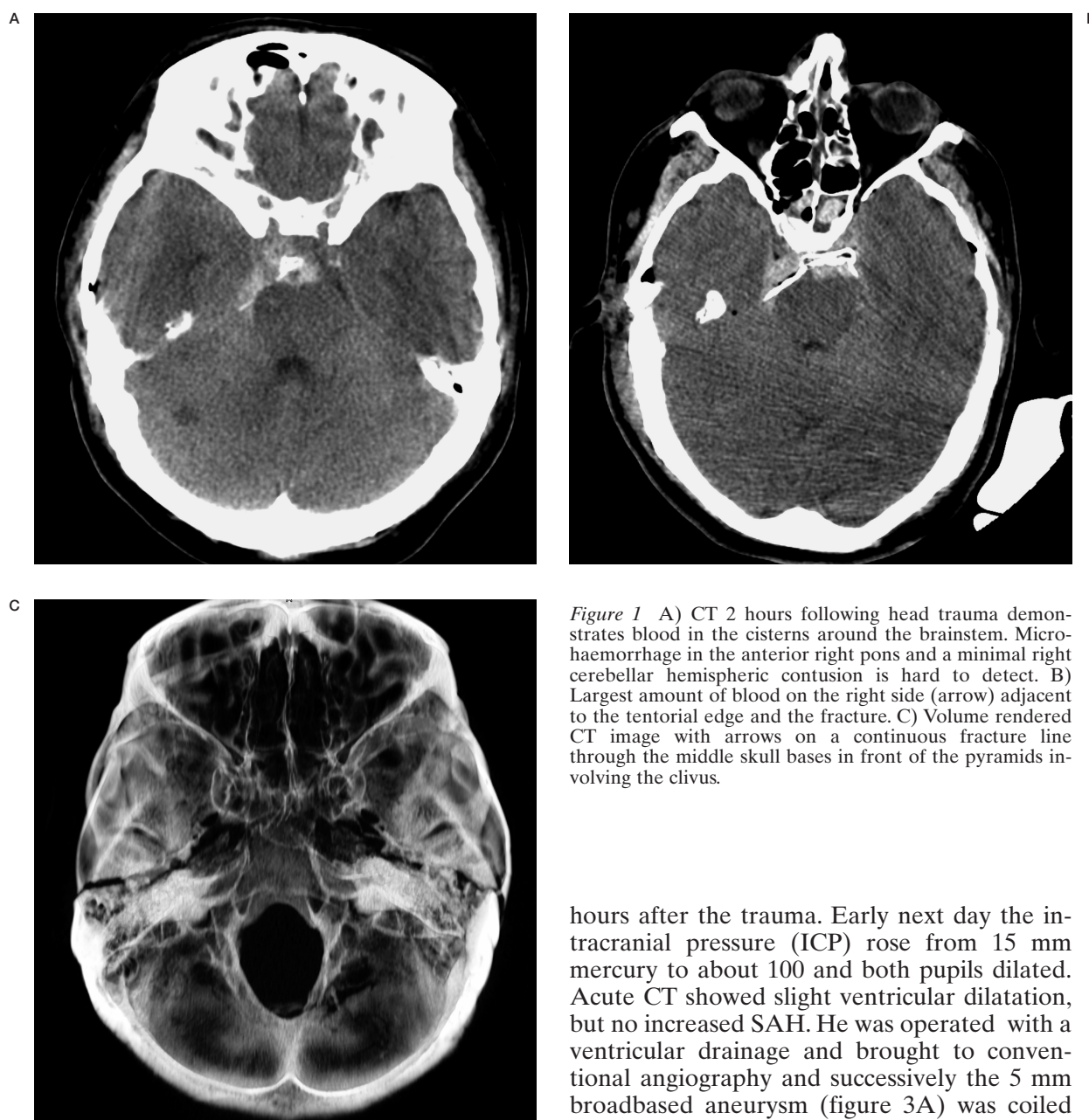
## Case Report

### History

A 40-year-old male guard at a construction site experienced a blunt head trauma when a stair construction fell down on him. He was unconscious for approximately 25 minutes. When admitted to a local hospital after 45 minutes he scored 3 on the Glasgow coma scale (GCS). His left pupil was dilated and he was intubated and then transported to our hospital and shortly after admission investigated with CT.

### Examination and treatment.

CT revealed extensive subarachnoid hemorrhage (SAH), especially around the brain stem (figure 1A,B). No additional intraventricular



*Figure 1* A) CT 2 hours following head trauma demonstrates blood in the cisterns around the brainstem. Micro-haemorrhage in the anterior right pons and a minimal right cerebellar hemispheric contusion is hard to detect. B) Largest amount of blood on the right side (arrow) adjacent to the tentorial edge and the fracture. C) Volume rendered CT image with arrows on a continuous fracture line through the middle skull bases in front of the pyramids involving the clivus.

blood or intracerebral hematoma was found. A skull base fracture through the upper clivus, posterior clinoid process and left carotid canal was detected on bone adjusted CT (figure 1C).

He was given a Codman ICP measurement device and then operated for a nose fracture. On the following morning CT angiography (figure 2) revealed an aneurysmal formation in close relation to the right superior cerebellar artery. Coiling was planned for the next day, 40

hours after the trauma. Early next day the intracranial pressure (ICP) rose from 15 mm mercury to about 100 and both pupils dilated. Acute CT showed slight ventricular dilatation, but no increased SAH. He was operated with a ventricular drainage and brought to conventional angiography and successively the 5 mm broadbased aneurysm (figure 3A) was coiled with 3 platinum coils (26 mm). The aneurysm was completely occluded together with the parent artery (figure 3B).

#### *Postoperative course*

On the 45<sup>th</sup> postoperative day his neurological progression slowed down and he was operated with a ventriculoperitoneal shunt (figure 4). Three months after the accident he was still in the follow-up unit for head injuries having a GCS of 3. Conventional angiography and MR-angiography demonstrated full occlusion of the aneurysm and the parent artery.

## Discussion

### *Diagnosis of traumatic aneurysms*

Resulting from the extensively use of CT in diagnosing head trauma traumatic cerebral aneurysms are less frequently found today<sup>2</sup>. The diagnosis of a pseudoaneurysm is supported by three main factors: the history of trauma, the location of the hemorrhage on CT and the angiographic findings of an aneurysm with a location other than at an arterial branching point. The location of a posttraumatic intracerebral hematoma around the anterior cerebral falx<sup>6,10,11</sup>, in relation to the anterior free edge of the cerebellar tentorium<sup>9,12</sup> or posttraumatic SAH interhemispherically or in the posterior basal cisterns may be a leading thread. Unusual position of the arteries in the cerebellomesencephalic groove and/or arteries adherent to the dura may also predispose to pseudoaneurysm formation following head trauma<sup>13</sup>. Young age may support the diagnosis of a traumatic aneurysm. Two cases<sup>1,5</sup> of a traumatic superior cerebellar aneurysm are reported in cases where a small tumor in the cisterns around the brainstem was suspected.

### *Traumatic aneurysm treatment*

The mortality rate is difficult to appreciate since mortality as well as morbidity are associated both with cerebral lesions and aneurysm he-

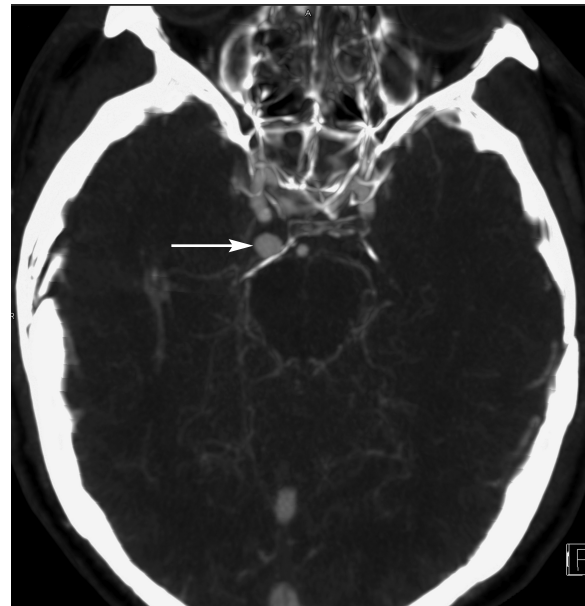


Figure 2 Thick slab axial MIP; CT-angiography 24 hours after trauma demonstrates filling of an aneurysm in the area with the most massive subarachnoid hemorrhage (arrow). Note the anterior and left dislocation of the posterior clinoid process.

morrhage. The mortality in untreated patients varies in the literature between 32% and 50% in not operated patients, and between 8% to 24% after surgical treatment<sup>6,14,15</sup>. The mortality and morbidity rates following neuroradiological

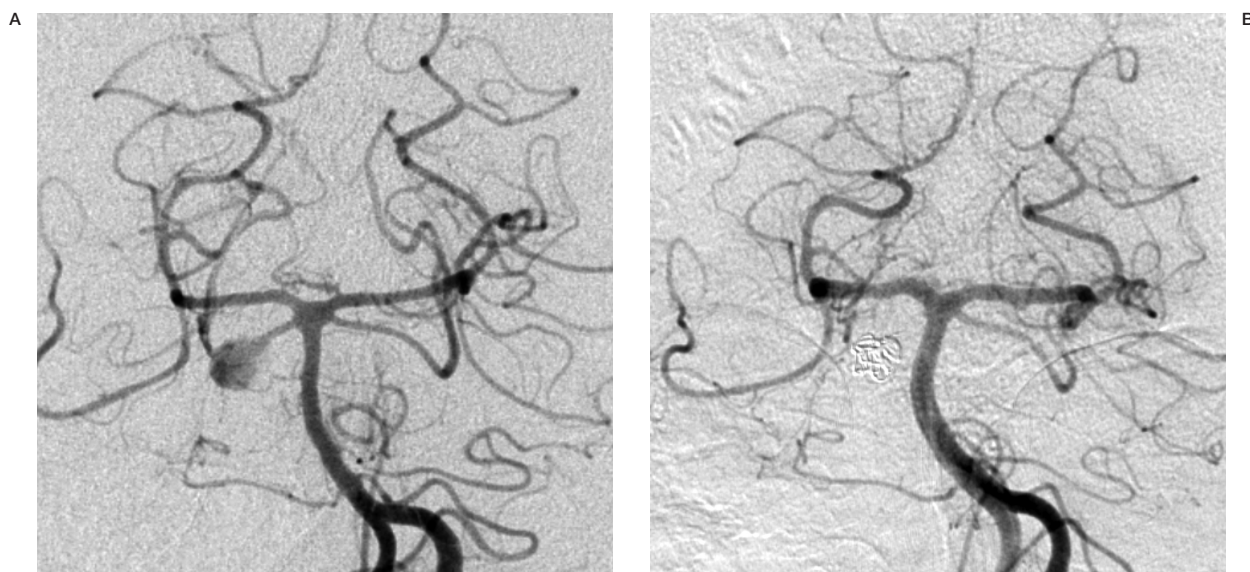


Figure 3 A) Cerebral DSA revealed an aneurysm on the proximal right superior cerebellar artery (SCA) away from the bifurcations (arrow). B) After coiling the aneurysm is occluded together with the parent artery.



Figure 4 CT 5 weeks after coiling showed the coil mass in a good position within the aneurysm (arrow) and residual dilation after removal of the initial shunt.

coiling of traumatic aneurysms in the SCA is unknown, but in other locations the results are mostly very favourable<sup>16,17,18,19,20</sup>. Spontaneous repair of a traumatic aneurysm may occur, but awaiting this option seems very unsafe<sup>10,21</sup>.

Our case is probably the first published coiled traumatic aneurysm of the SCA. As a consequence of the coiling of the aneurysm the parent SCA was occluded as well. The aneurysm had a broad base and since the use of a stent in this traumatised artery seemed too dangerous it was decided to sacrifice the SCA during coiling. The surgical approach was considered to carry several hazards. It is our strong belief that endovascular coiling is less invasive and should be the primary treatment option in these cases.

#### Literature

Out of several references to traumatic aneurysms in the posterior circulation we have found only two cases of the SCA. One was the result of a closed trauma<sup>5</sup> while the other resulted from a perforating trauma through the eye with a sharp object<sup>1</sup>. Both cases were operated, neither was embolized. Only one was treated with

surgery in the acute posttraumatic period and subsequently died<sup>1</sup>, while the other was misdiagnosed as a tumor before operation two weeks after the trauma.

There might be some discussion as to what to call a traumatic aneurysm. Pseudoaneurysm and true false aneurysm both indicate a total disruption of all wall elements. We assume that this is the case in most traumatic aneurysms, probably in ours as well. True traumatic aneurysm is an aneurysm where one or more wall layers are still intact<sup>1</sup>. Without pathological examination or surgery it is difficult to distinguish between the two types and we therefore consider it best to use the slightly imprecise term "traumatic aneurysm" in our case. The aneurysm is away from a branching on the parent artery<sup>16</sup>, and we therefore feel comfortable in presenting it as an aneurysm resulting from the severe head trauma.

Although these cases are extremely rare it seems important to consider a traumatic aneurysm more often in head traumas. It might be more common than is assumed since angiography is rarely performed today in connection with head traumas. We would like to draw special attention to cases with fractures through the skull base and upper clivus and with relation to the tentorial edge. We believe that the sharp fracture fragment and/or the tentorial edge play a role in the formation of these aneurysms. The association between skull base fractures and carotido-cavernous fistulas due to the shearing forces from the fracture itself is well known<sup>22</sup> and the same mechanism may be responsible for aneurysms arising in other locations as in our case.

#### Conclusions

We emphasize that special attention should be given to patients with SAH around the brainstem when fractures of the skull base and clivus are involved. The extensive use of CT in head traumas has reduced the use of angiographic procedures in trauma patients. Consequently traumatic aneurysms may be missed. CT-angiography, MR-angiography or conventional angiography should more often be performed in patients with traumatic SAH in the basal cisterns or interhemispherically. Since the mortality rate is 50% in untreated traumatic aneurysms an aggressive treatment with coiling seems indicated.

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